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Federal Communications Commission
Office of Secretary

January 9, 2003

Marlene H Dortch
Secretary
Federal Communications Commission
445 12th Street. SW
Washington, D.C. 20554

Re: Implementation of Section 11 of the Cable Television Consumer Protection and Competition Act of **1992,** CS Docket No. **98-82;** Implementation of Cable Act Reform Provisions of the Telecommunications Act of **1996,** CS Docket No. **96-85;** The Commission's Horizontal and Vertical Ownership and Attribution Rules, MM Docket No. **92-264;** Review of the Commission's Regulations Governing Attribution of Broadcast and Cable/MDS Interests, MM Docket **No. 94-150;** Review of the Commission's Regulations and Policies Affecting Investment in the Broadcast Industry, MM Docket No. **92-51;** Reexamination of the Commission's Cross-Interest Policy, MM Docket No. 87-154

Dear Ms Dortch:

Pursuant to Section 1 1206 *of* the Commission's rules, attached for inclusion in the record in the above-referenced proceeding is an article I authored, dated December 11, 2002. entitled "Pivotal Buyers and Bargaining Power: A Non-Linear Least Squares Estimate from the Cable Industry."

Please do not hesitate to contact me with any questions.

Sincerely,

Nodir Adilov

Nodir Adilov

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Pivotal Buyers and Bargaining Power: A Non-Linear Least Squares Estimate from the Cable Industry

Nodir Adilov

December 11, 2002

ABSTRACT

Raskovich (2001) suggests becoming pivotal through merger worsens the merging buyer's hargaining position. Adilov and Alexander (2002) show these results hold only in the case where huyer bargaining power is constant. In this paper, I estimate bargaining power by nonlinear least squares using data from an experimental cable study conducted by Bykowsky, Kwasnica, and Sharkey (2002), and reject the hypothesis that hargaining power is constant across buyers **even** when channel capacity constraints and 'most-favored-riation' clauses are absent. (JEL L40, L41, L96, L25)

I Introduction

Economic theory does not give a definitivr answer on how a surplus should, or would, be divided among parties to an exchange In fact, different assumption$ regarding the division of the surplus from trade yield significantly different

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theoretical conclusions. Such is the case in the cable industry.

Chipty and Snyder (1999) demonstrate that when the bargaining surplus is divided equally among parties, the change in bargaining position for a merged firm is solely determined by the shape of the value function. They estimate the value function to he convex for the entire cable industry; hence, merger worsens the merged firm's bargaining position. Chipty and Snyder argue that observed lower per customer transfer prices from larger buyers are due to cost efficiencies and not because of greater bargaining power on the part of larger buyers.

Raskovich (2001) extends the Chipty and Snyder (1999) model to include pivotal buyers. Pivotal buyers are large buyers whose contribution is necessary in order for sellers to recover their costs. In the model. Raskovich shows that, under a 50-50 split, becoming pivotal worsens the merged firm's bargaining position. The intuition behind this result, can be explained by the solution to the "streetlight" public good provision problem: smaller buyers free ride on larger buyers' contributions.

Adilov and Alexander (2002) generalize Raskovich's (2001) model to allow for any split of the surplus among parties. Adilov and Alexander show that Raskovich's pivotal buyer result only holds as long as the split is constant for all firms. However. when bargaining power differs across firms, Adilov and Alexander show that the use of the value function for evaluating merger effects can be misleading, and that pivotal firms can improve their bargaining position, sometimes at the expense of other smaller (pivotal) buyers. Clearly, whether bargaining power is constant across buyers is an important empirical question.

Bykowsky et al. (2002) conducted experimental studies of the cable industry to evaluate the effects of merger. They concluded that only under MFN status or channel capacity constraints will larger firms systematically gain greater benefits from trade. The purpose of this paper is to determine whether bargaining power is the same across firms under the pivotal mechanism - in the absence of channel capacity limitations and MFN provisions - using the Bykowsky et.al. experimental data.

The paper is organized as follows. First, I present a theoretical model of transfer price determination with asymmetric bargaining power and pivotal buyers. Next, I discuss the Bykowsky et al. (2002) data and the econometric techniques used to estimate bargaining power. In the penultimate section, I present, and discuss the results of estimation. Finally. I make some concluding remarks.

II Equilibrium Transfer Prices with Pivotal Buyers

In this section, following the model of Adilov and Alexander (2002), I define the transfer prices faced by pivotal and non-pivotal buyers, and define the equilibrium under a pivotal mechanism with variable bargaining power among buyers.

I assume that, there are I buycrs anti K sellers. Sellers are independent in the sense that transactions with one seller do not affect any buyer's behavior with respect to any other seller. This is a standard assumption for all of the models discussed in the previous section. I assume that the i^{th} buyer's surplus is given by $v_i = (q_i, q_{-i})$, while the supplier's gross surplus equals $V(Q)$, where $Q = \sum_{i=1}^{I} q_i$ is the total quantity purchased from the supplier. Specifically, $V(Q) = A(Q) - C(Q)$, where $A(Q) \equiv$ ancillary revenue, and $C(Q) \equiv$ total cost.

For the cable industry $A(Q)$ represents advertising revenue and $C(Q)$ represents the cost of programniing, which is usually fixed. The supplier will produce iff:

$$V(Q) + \sum_{i=1} T_i \geq 0 \tag{1}$$

Let:

$$q_i^* = \arg\max_x [v_i(x, q_{-i}) + V(Q_{-i} + x)] \tag{2}$$

where I assume there exists a q_i^* that maximizes joint surplus (the surplus from trade has to be positive at the optimal quantity for any buyer, i.e. $v_i + V - V_{-i} > 0$ for all i). Buyer i is pivotal if the seller cannot cover it's costs without buyer i, and therefore has to conclude an agreement with buyer i in order to produce. Formally, buyer i is pivotal iff

$$V(Q_{-i}) + \sum_{j \neq i} T_j < 0 \tag{3}$$

and

$$\max_x [v_i(x, q_{-i}) + V(Q_{-i} + x)] + \sum_{j \neq i} T_j \geq 0 \tag{4}$$

where $v_i(0, q_{-i}) = 0$. V_{-i} may vary across buyers.

Based on the pivotal mechanism, the transfer price for a non-pivotal buyer is given by $T_i = (v_i + (V - V_{-i}))(1 - \alpha_i) - (V - V_{-i})$ which can be written as:

$$T_i = v_i(1 - \alpha_i) - \alpha_i(V - V_{-i}) \tag{5}$$

The transfer price for a pivotal buyer [noting that for a pivotal buyer $\sum_{j \neq i} T_j + V_{-i} < 0$) can be written as $T_i = [v_i + (\sum_{j \neq i} T_j + V)](1 - \alpha_i) - V - \sum_{j \neq i} T_j$, or as:

$$T_i = v_i(1 - \alpha_i) - \alpha_i(\sum_{j \neq i} T_j + V) \tag{6}$$

Definition 1: Define theequilibriumin quantities to be purchased $(q_1^*, q_2^*, ..., q_n^*)$ and transfer prices $(T_1, ..., T_n)$ such that the following hold simultaneously for all i:

$$q_i^* = \arg\max_x (v_i(x, q_{-i}^*) + V(\sum_{j \neq i} q_j^* + x)) \tag{7}$$

$$T_i = v_i(x, q_{-i}^*)(1 - \alpha_i) - \alpha_i(V(Q^*) - V(Q^* - q_i^*)) \tag{8}$$

$$\text{if } \textstyle\sum_{j \neq i} T_j + V(Q^* - q_i^*) \geq 0$$

$$T_i = v_i(x, q_{-i}^*)(1 - \alpha_i) - \alpha_i(\sum_{j \neq i} T_j + V(Q^*)) \tag{9}$$

$$\text{if } \textstyle\sum_{j \neq i} T_j + V(Q^* - q_i^*) < 0$$

$$\sum_{j=1,...,n} T_j + V(Q^*) \geq 0 \tag{10}$$

Under these conditions, production is efficient and there exists an equilibrium that satisfies the conditions of Definition One. However, as shown by Raskovich (2001), the equilibrium may not be unique, even under 50-50 split. While the existence of multiple equilibria does not pose a theoretical problem, in the next section methods for avoiding estimation problems in the context of multiple equilibria will be discussed

III Data and Estimation

A Data

Bykowsky et al. (2002) conducred an experimental study to evaluate the effects of merger under different economic settings (capacity constraints, MFN clauses, etc.). In what follows, I use data from the no capacity constraint, no MFN treatment. with five buyers and four sellers. since this setting most precisely parallels the theoretical model from the previous section.[1] **Bykowsky** et al. refer to this case as the low rnntentration. no MFN. no capacity constraint treatment. In these experiments, buyers and sellers conducted eight rounds of trades. Each buyer **knew** its own size and valuation, but not the seller's valuation. Each seller knew its own valuation but not, the buyers' valuations. The price **was** negotiated by submitting buy and sell orders at a specific price with a specific seller or buyer. Both sellers and buyers could change their orders until the bid was accepted by *the* negotiating party. In accordance with cable industry practices, the negotiated prices were only known to the parties directly involved in the negotiation. The data from the experiments includes the transfer prices, buyers and sellers valuations, and the fixed costs of producers. There are 153 observations: ignoring seven trades for which parties could not reach an agreement during the allotted time period.

[1] Neither channel capacity constraints, nor MFN clauses give the desired level of control since buyers and **sellers** will directly affect the transfer prices, and not strictly or exclusively via the pivotal mechanism.

B Empirical Model of Transfer Price Determination with Pivotal Buyers

Actual transfer prices may differ from theoretically predicted transfer prices for several reasons. For the data from the Bykowsky et al. (2002) experimental study, the deviations may come from uncertainty concerning seller costs (buyer benefits). transfers from other buyers, or some random factors. Since buyers do not know seller costs and transfer prices to be paid by other buyers. they form an expectation concerning their pivotal-ness to program production. In the actual cable industry: buyers form their expectations based on previous transactions. market research, and signals from sellers and other buyers. Even if the buyer does not, know the transfer prices from other buyers, the seller is forced to negotiate tougher with pivotal buyers to cover its costs. Moreover, large buyers know that they are large arid therefore likely to be pivotal. Thus, the pivotal mechanism will likely affect the transfer price in some fashion. For buyer i being pivotal for seller k requires:

$$V_k(Q_{-i}) + \sum_{j \neq i} T_{k,j} < 0 \Leftrightarrow V_k(Q) - V_k(Q_i) + \sum_{j \neq i} T_{k,j} < 0 \tag{11}$$

I assume buyer i believes it is pivotal if $V_k(Q) - V_k(Q_i) + \sum_{j \neq i} T_{k,j} + u_{i,k} < 0$, where $u_{i,k}$ is normally distributed with mean 0 and variance σ^2. The magnitude of σ^2 (the parameter to be estimated by the model) indicates the accuracy of the prediction. The probability of buyer i being pivotal is $\Phi(\frac{V_k(Q_i) - V_k(Q) - \sum_{j \neq i} T_{k,j}}{\sigma})$ where $\Phi(.)$ is a c.d.f. for a normal distribution with mean zero and variance 1. Buyer i assumes that he is not, pivotal for seller k if $V_k(Q) - V_k(Q_i) +$

$\sum_{j\neq i} T_{k,j} + u_{i,k} \geq 0$. Thus, the probability that buyer i is not pivotal is $\Phi(\frac{V_k(Q)+\sum_{j\neq i} T_{k,j} - V_k(Q_i)}{\sigma})$.

If the buyer is non-pivotal, the transfer price is determined by *(5)*. However. one might expect, the transfer price to differ from this value **due** to factors not taken into consideration by the model. In particular, one might not expect agents to have the same transfer prices every period. Thr factors that induce these potential differences are assumed to be the same for both the pivotal and non-pivotal case. If the buyer is non-pivotal. the transfer price is:

$$T_{i,k} = v_{i,k}(1-\alpha_i) - \alpha_i(V_k - V_{-i,k}) + \varepsilon_{i,k} \tag{12}$$

If the buyer i is pivotal, then the transfer price is equal to the expected value of the transfer price as determined by equation (6). **given** that the buyer i is pivotal, plus an error term:

$$T_{i,k} = E[v_{i,k}(1-\alpha_i) - \alpha_i(\sum_{j\neq i} T_{j,k} + V_k + u_{i,k})|V_k(Q_{-i}) + \sum_{j\neq i} T_{k,j} + u_{i,k} < 0] + \varepsilon_{i,k} \tag{13}$$

Since there are two error terms, the error term regarding the buyer's being pivotal **is** restricted. The only condition for the second error term is that ε, is i.i.d. with $E[\varepsilon_n] = 0, \forall n$. When the buyer assumes it is pivotal, the $u_{i,k}$'s tend to be higher. i.e., $E[u_{i,k}|i \text{ is pivotal}] > 0$. Thus, there is a selection bias in transfer prices when the buyer is pivotal. Note that equation (13) simplifies to

$T_{i,k} = v_{i,k}(1-\alpha_i) - \alpha_i V_k(Q_i) + \varepsilon_{i,k} - \alpha_i E[(\sum_{j\neq i} T_{j,k} + V_k(Q_{-i}) + u_{i,k})|u_{i,k} < -V_k(Q_{-i}) - \sum_{j\neq i} T_{k,j}]$. Thus:

$$T_{i,k} = v_{i,k}(1-\alpha_i) - \alpha_i(\sum_{j\neq i} T_{j,k} + V_k) + \sigma \frac{\phi(\frac{\sum_{j\neq i} T_{j,k} + V_k(Q_{-i})}{\sigma})}{1-\Phi(\frac{\sum_{j\neq i} T_{j,k}+V_k(Q_{-i})}{\sigma})} + \varepsilon_{i,k} \quad (14)$$

Note that only the transfer price is seen from the raw data, and it is not known whether the buyer was assumed to be pivotal or non-pivotal during the transfer price determination. Since the probability that, a given buyer is pivotal for a yiven seller is known, I estimate the bargaining power from the following nonlinear model:

$$T_n = g(\overline{d}, \overline{v}, \overline{T} | \overline{\alpha}, \overline{V}. \sigma) + \varepsilon_n \quad (15)$$

or:

$$T_n = \sum_{i=5}^{9} \sum_{k=1}^{4} d_{i,k}(\Phi(\frac{V_k(Q) + \sum_{j\neq i} T_{k,j} - V_k(Q_i)}{\sigma})(v_{i,k}(1-\alpha_i)$$
$$-\alpha_i(V_k - V_{-i,k})) + \Phi(\frac{V_k(Q_i) - V_k(Q) - \sum_{j\neq i} T_{k,j}}{\sigma})(v_{i,k}(1-\alpha_i)$$
$$-\alpha_i(\sum_{j\neq i} T_{j,k} + V_k) + \sigma \frac{\phi(\frac{\sum_{j\neq i} T_{j,k} + V_k(Q_{-i})}{\sigma})}{1-\Phi(\frac{\sum_{j\neq i} T_{j,k}+V_k(Q_{-i})}{\sigma})})) + \varepsilon_n$$

which simplifies to following nonlinear function:

$$T_n = \sum_{i=5}^{9} \sum_{k=1}^{4} d_{i,k}(v_{i,k}(1-\alpha_i) + \sigma\phi(\frac{\sum_{j\neq i} T_{j,k} + V_k(Q_{-i})}{\sigma})$$

$$-\Phi(\frac{-V_k(Q_{-i}) - \sum_{j\neq i} T_{k,j}}{\sigma})\alpha_i(V_k(Q_{-i}) + \sum_{j\neq i} T_{k,j})) + \varepsilon_n \quad (16)$$

where T_n is the transfer price from the negotiation between buyer j and seller l.[2] Note that, d is a dummy variable that is equal to 1 if $i = j$ and $k = l$, and 0

[2]This formulation allows for an un-balanced model. since we do not require all the buyers to conduct successful trades every period and there is nu time dimension included

otherwise.

I assume that a buyer's bargaining power varies from buyer to buyer, but does not change from seller to seller and from period to period.[3] There are $N = 153$ observations, with six parameters to be estimated. The sellers are indexed by 1, 2, 3. 4, while the buyers are indexed by 5. 6. 7, 8, 9. Finally. α_i represents buyer i's bargaining power.

IV Estimation Results

I begin by estimating the restricted model that assumes bargaining power is constant across firm *size*. These results are presented in Table 1. Clearly, the estimates of both bargaining power and sigma are significant. Note that bargaining power is estimated to be 0.6794. Thus, even without estimating the unrestricted model it is clear that the hypothesis that bargaining power is 0.50 is rejected at the 99% confidence level.

Next: I estimate the unrestricted model where bargaining power is allowed to vary across buyers. The nonlinear least squares estimation result, are presented in Table 2. **As** can be seen from the table, all parameter estimates are significant. Notice that for buyer 9, bargaining power is 0.2985, while it is between 0.64 and 0.75 for all other buyers. Note that, the adjusted R-Squared has increased from 0.8363 to 0.9210, which suggests that the efficiency gains from unrestricted model are high. Finally, I test *the* restricted model versus the unrestricted model. Specifically:

[3] This is a standard assumption in the models discussed in the introduction.

H_0 : Restricted Model (bargaining power is constant across buyers)

H_A : Unrestricted Model (bargaining power is asymmetric).

Under H_0, $t = \frac{(e*'e*-e'e)/5}{e'e/(153-6)} \sim F(5, 153-6)$.[4], where $e*'e*$ is the residual from restricted model and e'e is the residual from unrestricted model. This calculation gives $t = 44.638$ and the restricted model is rejected at the 99% confidence level.[5]

V Discussion

The question of symmetry of bargaining power is important in evaluating a mergers effect on a merged firm's bargaining position. If bargaining power is constant across firms and there is no pivotal mechanism (the Chipty and Snyder case), the merged firm's bargaining position will be solely determined by the shape *of* the value function. Moreover, when we include the pivotal mechanism: becoming big negatively affects the merged firm's bargaining position (the Raskovich case). However. these results hold only for the case of constant bargaining power across firms. When bargaining power increases with firm size, becoming pivotal can allow thr merged firm to improve its bargaining position. This improvement in bargaining position tends to increase the transfer prices from smaller pivotal buyers to sellers. Adilov and Alexander (2002) suggest several reasons why the merging firm's bargaining position might increase. These

[4] See Greene, page 344.

[5] F(5,147) for the 99% contidencr level is 3.02. One can also test whether all bargaining power coefficients arc jointly equal to the value from the restricted model. The test statistic t should be distributed as $F(5,147)$. This calculation gives $t = 44.61$ and, once more, the hypothesis is rejected at the 99% confidence level.

reasons include (but are not restricted to) informational benefits, retention of higher quality bargaining skills, a lower risk aversion coefficient. and a lower discounting factor for the merged firm.

Nonlinear least squares estimates of bargaining power based on the experimental data from the Bykowsky et al. (2002) experiments, suggests that bargaining power differs considerably among buyers even in the absence of capacity constraints or LIFN clauses. Bykowsky et al. estimate that MFN clauses increase buyer's bargaining power significantly: however. there is a significant, gap in the economic literature concerning the emergence of MFN clauses in the cable industry. It appears that zero marginal distribution costs and non-rivalrous provision of television programming creates a unique and contradictory environment for implementing MFN clauses. Furthermore, there is uncertainty about the payments from the cable operator to program provider since the payment includes a fixed transfer and advertising time. Advertising revenue makes cable operators revenue fluctuate considerably depending on program quality and audience sizes. All these suggest, that MFN clauses and the shape of the value function are not the only factors that explain the lower transfer payments from larger buyers.

The estimation results suggest that hargaining power is not symmetric across firms, even in controlled experimental environments without MFN clauses or channel capacity constraints. It follows that there is no reason to expect that bargaining power is constant in more complex environments.

References

[1] **Nodir Adilov and Peter J. Alexander,** Federal Communications Commission, Media Bureau Staff Research Paper No. 13, *"Asymmetric Bargaining Power and Pivotal Buyers,"* (rel. October 9, 2002)

[2] **Nodir Adilov and Peter J. Alexander.** Federal Communications Commission, Media Bureau Staff Research Paper No. 14, *"Most-Favored Customers In the Cable Industry."* (rel. October 9. 2002).

[3] **Mark Bykowsky, Anthony M. Kwasnica and William Sharkey,** Federal Communications Commission Office of Plans and Policy, OPP Working Paper No. 35, *"Horizontal Concentration in the Cable Television Industry: An Experimental Analysis."* (rel. June 3. 2002).

[4] **Tasneem Chipty and Christopher M. Snyder,** *"The Role of Finn Size in Bilateral Bargaining: A Study of Cable Television Industry,"* Review of Economics and Statistics 81(2)(1999), 326-40.

[5] **William H. Greene,** *"Econometric Analysis,"* 3rd ed. (Upper Saddle River, NJ: Prentice-Hall, Inc. 1997). 333-374.

[6] **Alexander Flaskovich.** US Department of Justice, Economic Analysis Group Discussion Paper 00-Y, *"Pivotal Buyers and Bargaining Position",* (as of October 22, 2001).

Table 1: Restricted Nonlinear LS: Constant Bargaining Power

Number of Obs	=	153
F(2.151)	=	319.48
Prob > F	=	.0000
R-Squared	=	.8089
Adj R-Squared	=	.8063
Root MSE	=	100.682
Rrs dev	=	1843.444

T_n	Coef	Std. Er	t	$P > \|t\|$
α	,6793967	,0128873	52.72	.000
Sigma	1137688	34 94846	3.26	.001

Table **2:** Unrestricted Nonlinear LS: Asymmetric Bargaining Power.

Number of Ohs	=	153
F(6 147)	=	298.28
Prob > F	=	0000
K-Squared	=	.9241
Adj R-Squared	=	.9210
Root MSE	=	64.3026
Res. dev.	=	1702.136

T_n	Coef	Std. Et	t	$P > \|t\|$
α_5	,7042558	.0144198	48.84	.000
α_6	,6484863	.0260494	24.89	.000
α_7	,7206213	.0232192	31.04	.000
α_8	.7434435	.0135440	**54.89**	.000
α_9	.2985069	.0274519	10.89	.000
Sigma	**102.4373**	22.03877	4.65	.001